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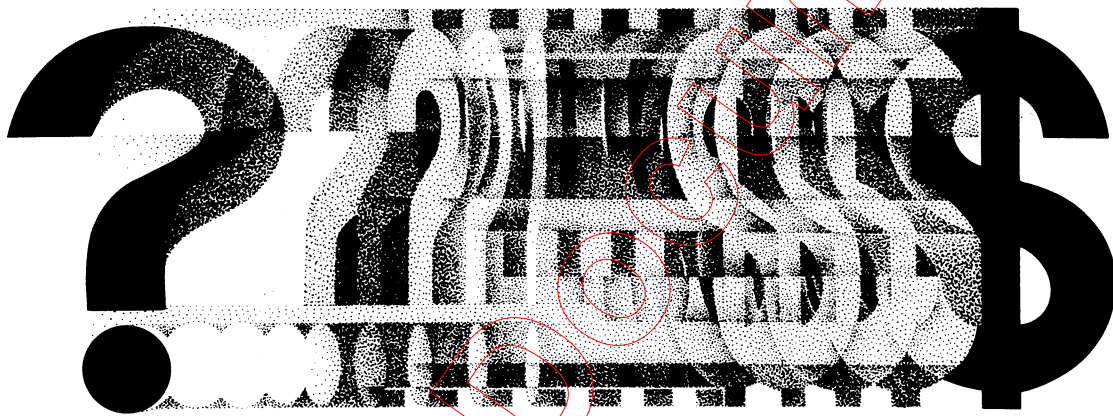
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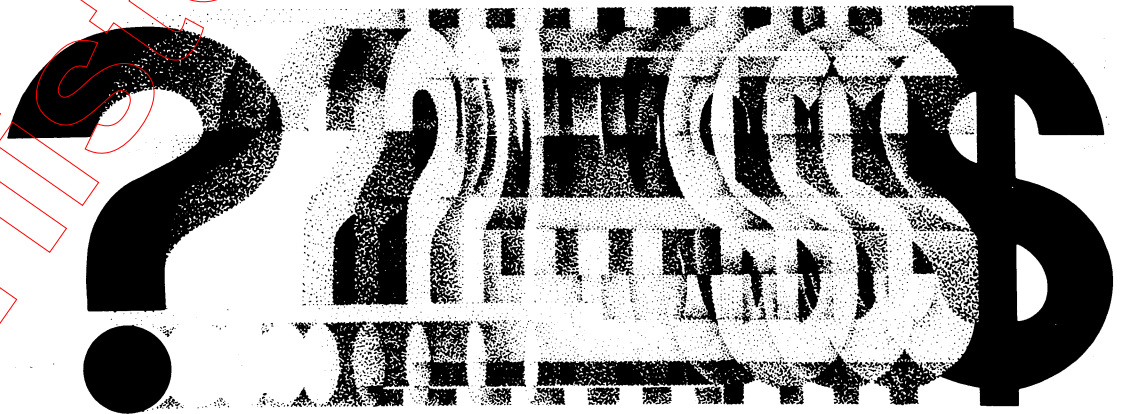
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RISK MANAGEMENT IN AGRICULTURE :



Risk Management Strategies

Historic Document





RISK MANAGEMENT IN AGRICULTURE

Risk Management Strategies

George F. Patrick, Extension Economist

Introduction

Farmers make decisions in a risky, ever-changing environment. The consequences of their decisions are generally not known when the decisions are made, and the outcome may be better or worse than expected. Variability of prices and yields are major sources of risk in agriculture. Changes in technology, legal and social concerns and the human factor itself also contribute to the risky environment for farmers. Risky situations of concern are typically those in which 1) there is a high probability of adverse consequences, and/or 2) the adverse consequences, should they occur, would cause significant disruptions.

Farmers and other business people generally do not get into risky situations unless there is a probability of making money. It is to their advantage that these risky but potentially profitable situations be managed as carefully as possible. Effective risk management involves anticipating possible difficulties and planning to reduce their consequences, not just reacting to unfavorable events as they occur. The two primary aspects of risk management are: 1) anticipating that an unfavorable event may occur and acting to reduce the probability of its occurrence and 2) taking actions which will reduce the adverse consequences should the unfavorable event occur.

For example, risk management in the machinery area might involve a complete overhaul of an old tractor before the busy season to reduce the chances of a major breakdown. Also, during planting and harvesting, most farmers keep some key spare parts readily available. These parts do not prevent a breakdown from occurring, but the unfavorable consequences are reduced. However, risk management techniques—no matter how

effective—cannot resolve serious, chronic cash-flow difficulties.

Individuals are not the same, nor are their personal and financial circumstances. This series of publications is designed to help farmers develop their own risk management strategies, ones appropriate to their attitudes and circumstances. Included in this series on risk management in agriculture are the following three publications.

EC-647, *Decision-Making in a Risky Environment*, discusses goals and risk attitudes which differ among individuals. Factors important in decision-making under risk are explained. These include probabilities, measures of variability, expected values and expectations. This publication is intended to help farmers recognize some of the factors underlying the decision-making process and also to facilitate understanding of the other publications in the series.

EC-648, *Variability and Risk in Indiana Agriculture*, identifies sources of risk in agriculture and discusses producers' views of the importance of different sources of variability in crop and livestock production. Data on the historical variability of prices and yields of the primary commodities are presented, and some managerial implications are discussed.

EC-649, *Risk Management Strategies* (this publication), examines production, marketing and financial responses farmers use to deal with risk. Producers' views of the importance of these risk responses and their use of them are reported. The concept of risk balancing is introduced, and the need for an integrated risk management strategy combining production, marketing and financial responses is discussed.

Risk Management Strategies

Risk management strategies are developed to provide some protection in situations in which the consequences of a decision are not known when the decision is made. Risk management strategies may reduce the probability of an unfavorable event occurring and/or reduce the adverse consequences if the event occurs. However, in gaining protection from a possible loss, part of the potential gain is generally given up. In other words, most risk management strategies have a cost associated with them, even if it is not explicit. Generally, farmers would like to avoid major losses, but would also like to be in a position to benefit from favorable events. The trick is to effectively manage risk without unduly sacrificing gains.

Some risk management strategies reduce the risks associated with farming. For example, a farmer may reduce production risks through the choice of "conservative" production activities and cultural practices. Although risks are lessened, production risks are not eliminated. Furthermore, the farmer continues to bear risks associated with prices and other factors. Other risk management strategies allow a farmer to shift or transfer risks to another individual or institution. Buying fire insurance on machinery and buildings transfers the risk of loss from fire to the insurance company. The insured individuals are paying a premium to shift the risk. The chance of fire is unchanged, but the effect of a fire on an insured individual is reduced. Another way of shifting or transferring risks is through forward contracting or hedging. The farmer is protected from the risk of a price decline, but forgoes the opportunity to benefit from price increases.

Risk responses or methods of dealing with variability are commonly grouped into production, marketing and financial responses. As the names imply, production and marketing responses deal directly with the production and market types of risk. Production responses generally act to reduce risk by reducing the variability in production. Marketing responses may also reduce risk by reducing variability or may involve transferring price risks to other individuals or institutions. In contrast, financial responses generally emphasize the firm's capacity to bear risk and do not reduce the probability of an unfavorable event. "Going broke" may be expressed as a risk, but it is really the consequence of one or more other risks. Financial responses, such as insurance, may also transfer risks to others and provide the means with which the firm can withstand adverse consequences should they occur.

The various risk responses have different effects on the farm business, but none of the responses can provide protection from all types of risks. As a result, most farmers use a combination of production, marketing and financial responses in their risk management strategy. Because farmers differ in their goals and attitudes, as well as their personal and financial situations, their risk management strategies also differ.

This publication discusses the production, marketing and financial responses which farmers can use to deal with risk. The costs and benefits of these responses are briefly examined. Results from a study of 149 producers in 12 states are used to illustrate the importance of various risk responses and their use by producers.¹ The idea of risk balancing is introduced, and the need for comprehensive risk management, integrating production, marketing and financial responses is discussed.

Production Responses

There are a number of production responses to variability which can be made by farmers. These responses generally involve trading a reduction in the level of average income for reduced year-to-year variability of income. Production responses have traditionally been very important in risk management, but have declined in relative importance as farms have become larger, more specialized and more capital intensive.

Typical Production Responses

Most of the production responses to variability available to farmers have the effect of reducing the variability in production. Some production responses reduce the chances for unfavorable events occurring, and others provide protection against adverse consequences.

Choosing Low Risk Activities

The selection of crop and livestock enterprises can affect the production variability faced by farmers. There is little difference in the yield variability of the most common Indiana crops: corn, soybeans and wheat. When the effects of yield trend for the 1960 to 1985

¹George F. Patrick, "Producers' Attitudes, Perceptions and Management Responses to Variability," *Risk Analysis for Agricultural Production Firms: Concepts, Information Requirements and Policy Issues*, Department of Agricultural Economics, University of Illinois, AE-4574, July 1984, pp. 197-236, and George F. Patrick et al., "Risk Perceptions and Management Responses: Producer-Generated Hypotheses for Risk Modeling," *Southern Journal of Agricultural Economics*, Vol. 17, No. 2, December 1985, p. 231-238.

period are removed, the coefficients of variation for state average yields were 10.6 percent for corn, 8.8 percent for soybeans and 8.7 percent for wheat. (See EC-647, *Decision-Making in a Risky Environment*, for a discussion of coefficients of variability and EC-648, *Variability and Risk in Indiana Agriculture*, for a discussion of yield trends.)

The yield variability of corn, soybeans and wheat for individual farmers is likely to be considerably greater than that indicated by state average yields. Farmers are also likely to be aware of differences in the yield variability of crops associated with soils, management and other factors on their own farm. Because of these factors, an enterprise may be considered a high-risk activity by one farmer and a low-risk activity by another.

Specialty crops, such as tomatoes and vegetables for processing, commonly have greater year-to-year production variability than the more common crops. Although specialty crops may offer the possibility of high gross returns, they may also involve higher production costs and difficulties in finding marketing outlets. Because of these factors, specialty crops would not be considered low-risk activities for most producers.

There are differences in the variability of returns for livestock enterprises in 1985 dollars, as indicated in Table 1. Rather than yields, as was the case for crops, the returns being considered here are the income after deducting feed costs and feeder animals purchased and after adjusting for inflation. This return is basically what is left for the operator's labor, capital investment and other out-of-pocket costs and reflects both price and yield variation. The variability of returns for each enterprise was greater in the 1973 to 1985 period than from 1960 to 1972. The message is fairly clear—if you like risk, then have beef

cows or feeder cattle. If you are averse to risk, milk cows!

Diversifying Enterprises

Diversification is a risk management technique traditionally used by farmers. If one enterprise did not do well, the farm had other enterprises on which to rely. Returns were generally not as high as with specialization, but year-to-year variability was reduced.

Economics and agronomics lead many Indiana farmers to a corn-soybean rotation. Costs are reduced and yields improved relative to continuous corn. In addition, because corn and soybean yields do not vary exactly together, there are risk-reduction benefits from diversification. Diversification may also result in greater timeliness of operations and in increased returns. For most farmers, combining corn and soybeans is not just risk management—it is good management!

Some factors can work against diversification in crops. For example, corn and soybeans use similar machinery and equipment, but many specialty crops which can be grown in Indiana may require special equipment. Thus the benefits of diversification may be offset by increased costs. Other crop enterprises may provide very low returns to capital, labor and management. Although variability could be reduced by including these enterprises in the farm business, most farmers are unwilling to accept the reduced income which also results.

Combining livestock with the crop enterprises is a common means of diversification on many farms. Table 2 presents the average labor income per operator, in 1985 dollars, by type of farm for the 1960 to 1983 period. The income variability for all groups of farms was greater in the 1973 to 1983 period than from 1960 to 1972, reflecting the greater price vari-

Table 1. Average Returns Above Feed Costs and Costs of Purchased Animals in 1985 Dollars (Ave.) and Coefficients of Variation (C.V.) for Selected Illinois Livestock Enterprises 1960-85.^a

Enterprise	Unit	1960-72		1973-85		1960-85	
		Ave. (\$)	C.V. (%)	Ave. (\$)	C.V. (%)	Ave. (\$)	C.V. (%)
Hogs, farrow-to-finish	cwt.	22.64	39.7	24.00	51.7	23.32	45.6
Hogs, purchased feeders	cwt.	11.38	64.9	11.65	70.6	11.51	66.5
Feeder cattle	cwt.	16.50	69.9	12.64	141.1	14.57	101.8
Beef cows	cow	142.22	46.4	81.61	206.5	111.92	115.4
Dairy cows	cow	830.43	16.9	1067.70	26.2	949.05	26.2

Source: Based on "Summary of Illinois Farm Business Records," Cooperative Extension Circular 1019 (various years) and related publications, College of Agriculture, University of Illinois.

^aPrices are converted to 1985 dollars using the GNP implicit price deflator.

Table 2. Average Labor Income Per Operator in 1985 Dollars (Ave.) and Coefficients of Variation (C.V.) for Selected Types of Indiana Farms 1960-83.^a

Type of Farm	1960-72		1973-83		1960-83	
	Ave. (\$)	C.V. (%)	Ave. (\$)	C.V. (%)	Ave. (\$)	C.V. (%)
Hog	32033	73.2	48846	93.6	39379	89.6
Dairy	19182	42.3	22593	92.9	20746	72.9
Crop	23308	52.9	43491	97.8	32559	95.7
Crop-Hog	32307	88.4	39869	96.3	35773	94.6
All farms	25829	55.8	42353	93.8	33403	88.0

Source: Based on Purdue Farm Record Summary - State (EC 253) for various years.

^aPrices are converted to 1985 dollars using the GNP Implicit Price Deflator.

ability. Dairy farms had lower year-to-year income variability than other groups, but income was only two-thirds that of crop farms and about one-half that of hog farms.

Figure 1 illustrates the year-to-year variability in average annual labor income per operator on hog and dairy farms for the 1960 to 1983 period in 1985 dollars. Although the trend line (the straight line) for hog farms rises slightly, there is no statistically significant trend in income for hog or dairy farms. The much wider year-to-year variability of hog farm labor incomes is evident, as is the higher average income. Both types of farms have shown some losses in recent years.

Figure 2 illustrates the variability of annual labor income per operator on hog and

crop farms during the 1960 to 1983 period. After the influence of inflation has been removed, there is no statistically significant linear trend in incomes. In contrast to dairy farms, crop farm incomes show a year-to-year variability which is similar to those on hog farms. Relative variability, as indicated by the coefficient of variation (Table 2) of crop farm income (95.7 percent), is actually greater than for hog farms (89.6 percent).

The data presented are not adequate to really analyze the effects of diversification on income variability because the table reflects more than diversification. Many farms are combined. The farm categories are not pure (most hog farms sell crops too), and some change category as relative prices change.

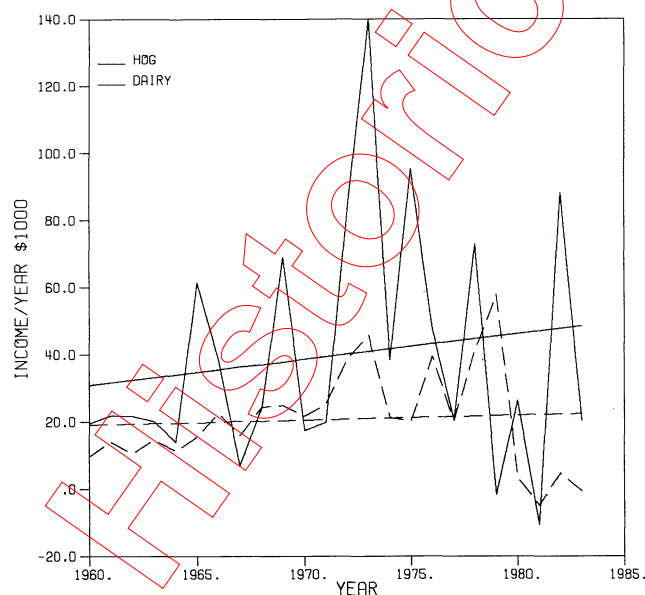


Figure 1. Average Annual Labor Income per Operator on Hog and Dairy Farms, in 1985 Dollars, 1960 to 1983.

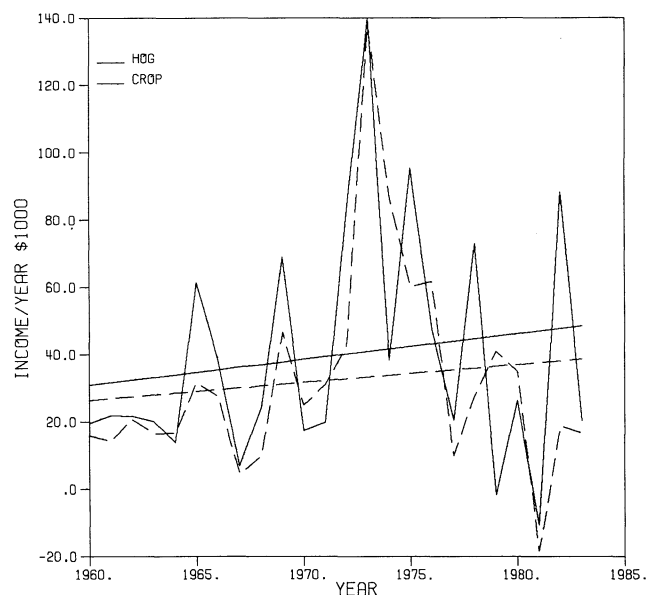


Figure 2. Average Annual Labor Income per Operator on Hog and Crop Farms, in 1985 Dollars, 1960 to 1983.

Resources are not the same for different types of farms. Some dairy farms have lower capital costs which are not adequately reflected in the income information. Finally, the incomes already reflect the use of risk management strategies.

The trend toward increased specialization suggests that cost savings associated with specialization more than offset the increased variability of income for many farmers. However, with the decline of diversification, farmers should be aware of the need for other responses to risk.

Enterprise diversification received an average value of 2.94 (moderately important) on a 4-point scale as a means of dealing with variability in crop and livestock production by 149 producers in a 12 state study of farmers' risk responses.² However, midwestern producers gave it a value of only 2.68. Furthermore, 65 percent of the midwestern producers indicated they used diversification as a response to variability, as opposed to about 78 percent overall. This reflects the midwest's comparative advantage in corn, soybeans and hogs.

Dispersing Production Geographically

Geographic dispersion of production activities reduces the impact of localized weather conditions. Only about 35 percent of the midwestern farmers interviewed indicated that they tried to disperse their production geographically. Availability of land for rent or purchase has some impact on this. Often farmers trying to increase the size of their crop operations must farm over a wide area. However, farmers also recognized the added costs of operating over a wide area. Often farmers have a variety of soil types—some heavy and some lighter soil within a limited geographic area. Having some ground which they can work early is one way of spreading risk as well as getting increased efficiency in machinery and labor use.

Farmers surveyed in the wheat and ranch areas of the U.S. placed more importance on geographic dispersion than those in the Corn Belt. These wheat farmers and ranchers often believe that storms move from the southwest to the northeast and thus try to scatter their farms from the northwest to southeast to reduce damage from a localized storm. Over 57 percent of the western small grain producers were geographically dispersed in production.

²Producers were asked to indicate the importance of different risk responses in their operations and whether they used the risk response. A four point scale was used, with 4 indicating very important, 3 moderately important, 2 slightly important and 1 indicating not important.

Selecting and Diversifying Production Practices

Selection and diversification of production practices are fairly common. Over two-thirds of the Corn Belt farmers interviewed indicated they used this response to variability. Planting several different hybrids, applying different herbicides and maintaining flexibility to adjust to changing conditions were also commonly cited examples.

Production practices selected may be informal insurance schemes. Many farmers routinely use antibiotics in livestock feed or use insecticides and other chemicals in crop production, even though these inputs are not always required. Maintaining excess machinery capacity or feed reserves to offset unfavorable weather are other examples. The periodic overhaul and routine maintenance of machinery and equipment are also means of reducing the probability of breakdowns during critical times. The costs of the additional antibiotics, insecticides, chemicals, machinery and feed reserves must be compared with possible losses when not using these inputs in production practice decisions.

Some midwestern farmers have considered irrigation as a means of reducing yield variability. However, unlike the production practices discussed above, substantial capital investment and new management skills are required for irrigation. Irrigation may reduce production variability but increase the financial risk of the business.

Maintaining Flexibility

Farmers typically indicated that maintaining flexibility in their operations was a production response to variability. Increasing specialization of livestock facilities and equipment limits flexibility among types of livestock, and often there is a similar situation with respect to crops.

Over 65 percent of the farmers interviewed indicated that they practiced flexibility in their farm organization. However, they indicated that this flexibility was much more in their marketing and financial decisions than in the type and size of production activities. Often the costs associated with flexibility in production are higher than most farmers are willing to incur.

Varying Production Capacity

The practice of idling acreage and varying livestock production with changes in economic environment is a risk response not considered very important (2.07 on the 4-point scale). About 57 percent of the farmers indicated that they did vary production capacity. Land may be idled as required for participation in

government programs, but generally not as a production response to risk.

Some hog producers indicated that they would vary their use of facilities depending on expected conditions. If they thought prices would be good, they would crowd facilities and increase production. Conversely, they would try to increase efficiency and cut costs if prices were not good. The fixed cost component of many livestock operations is large; thus, in many situations the facilities are utilized rather than left idle to minimize losses.

Management Implications

There are a number of production responses to variability available to Indiana producers, but the effectiveness of these responses may be limited. Economic and agronomic considerations often limit the possibilities of enterprise diversification and geographic dispersion of production for many producers. Flexibility in operations and varying production capacity also have only limited roles as management responses to variability. Selection and diversification of production practices is the primary production response available to Indiana farmers for risk management.

Farmers would probably express their production response to variability as "being a good farmer." For many farmers this means having low production costs per unit to increase the profit margin and to provide a cushion for adversities such as low prices or yields. Often this will involve a number of the production responses discussed.

Marketing Responses

The increased variability of commodity prices since the early 1970's has increased farmers' awareness of price risks and placed a premium on good marketing skills. Many farmers have attempted to improve their knowledge of marketing and develop new marketing skills. New marketing responses to variability, like options trading, are also being developed.

Typical Marketing Responses

Some marketing responses reduce risk by reducing variability, but other marketing responses involve the transfer of risks to others. Commonly, producers utilize a combination of marketing responses in their farm operations.

Obtaining Market Information

This response was given an importance rating of 3.26 on the 4-point importance scale by the producers interviewed, the highest of all marketing responses. Over 90 percent indi-

cated that they followed the markets. Many farmers also obtain outlook information, chart or use charting services and subscribe to various marketing services. Obtaining market information is not difficult, according to many farmers, but obtaining "good" information is.

Acquiring market information does not constitute a response to risk or variability. Although acquiring information is the starting place, market information must be combined with other actions before there is an effect on variability.

Participating in Government Programs

Participating in or maintaining eligibility for government commodity programs is a marketing response to variability used by many producers. Although considered less important (2.76) than obtaining market information, almost 75 percent of the producers interviewed indicated that they participated in or maintained eligibility for government programs in 1983.

Government programs provide downside price protection for some commodities. At different times this protection has taken the form of price supports, loan programs, target prices, deficiency payments and payments-in-kind. Cost of this protection has varied by commodity and from year-to-year. In some instances there have been no restrictions on eligibility for participation; thus, the government program has functioned as no-cost price insurance. Acreage controls, set-asides, reduced marketing flexibility and storage requirements have been associated with other government programs. Generally, the costs of participation have been higher when potential benefits from participation have also been higher.

Typically, farmers can determine whether or not to participate in a government program on an annual basis. Participation in one program may require participation in other applicable programs (cross compliance). However, farmers can analyze potential effects of participation or non-participation based on their individual circumstances and the specifics of the program. Participation may be advantageous in some years and not in others.

Spreading Sales

The spreading of sales, making several sales of a commodity during a year, was given an importance rating of 2.88 on the 4-point scale and was used by over 77 percent of the producers interviewed. Dairymen and many other livestock producers are forced to spread their marketing over the entire year because of the nature of their production. With frequent sales throughout the year the average price

received by a producer is nearly equal to the season or annual average price.

Producers with marketing flexibility can also spread cash sales and obtain a price similar to the season average price. This procedure enables a producer to avoid selling all of the production at the bottom of the market. Spreading sales guarantees that the producer's average price will be close to the season average price, but also guarantees that the price received will not be much above average. Furthermore, although spreading sales throughout the year essentially averages out the within-year variability, it does little to reduce year-to-year variability.

Forward Contracting

The practice of forward contracting can be used for both inputs and outputs. Some farmers contract needed quantities of inputs at specified prices to avoid the risk of price increases and unavailability of inputs. Similarly, some producers forward price some of their production. Although farmers differed in their views of forward contracting, almost 77 percent of the producers interviewed in the 12-state study did some forward contracting of production or needed inputs.

Hedging

Use of futures contracts is another marketing response which has the potential for reducing risk. Farmers can sell commodities on the futures market and assure themselves of a price, except for basis changes. Futures contracts are also available on some inputs used by some farmers, especially livestock feeders. Futures contracts introduce additional flexibility into an individual farmer's marketing responses. For a discussion of hedging with futures contracts see EC-507, *How Farmers Can Use the Futures Market*.

Many producers indicated that they feel uncomfortable trading on the futures market because they do not understand futures trading. Hedging through the futures market was given an importance rating of 1.63 on the 4-point scale (2 = somewhat important), the lowest of any of the marketing responses. Less than 20 percent of the producers interviewed were using the futures market, although use exceeded 25 percent by midwestern producers interviewed.

Options Trading

A marketing response which has recently become available in some agricultural commodities is options trading. Options increase the marketing alternatives available to individuals. Agricultural options will provide a

farmer with the opportunity to secure price insurance. However, options will not always be able to guarantee a profit. Options can eliminate the negative financial impacts of an adverse price move and allow the farmer to share in the positive financial impacts of a favorable price move. Costs associated with options trading may be higher than an individual anticipates.

As with trading futures contracts, an individual must acquire a new vocabulary of terms and concepts. EC-613, *Options Trading in Agricultural Commodities*, and NCR Extension Publication 217, *Producer Marketing Management: Primer on Agricultural Options*, explain options trading.

Management Implications

Most marketing plans or marketing strategies use several of the market responses discussed above. Typically, a farmer may combine hedging (or forward contracting) with cash sales. Sales may be made at several points during the overall marketing period, a way of spreading sales.

Some strategies are linked to costs or returns—"Price when total production costs are covered." Other strategies deal with timing—"Price around the seasonal high." Fundamental and technical analyses are commonly used to determine selling strategies. Some people follow routine strategies, while others attempt to vary their strategy in response to market information.

Researchers and extension economists have analyzed a number of marketing strategies. Pricing based on costs of production tends to increase price and reduce variability when positive margins exist in the market. Price protection is also provided when margins are negative, but many farmers hesitate to lock in a loss even if the possibility of further losses is eliminated. Timing strategies based on cyclical and seasonal price factors can be effective. One conclusion is clear—the same strategy does not work all the time. Furthermore, there is no guarantee that a strategy that has worked well in the past will be successful in the future. Therefore, farmers need to continually analyze and evaluate their marketing strategies, making improvements as conditions change.

Many producers have much more knowledge and information about how to produce a commodity than how to market it. Some useful references on marketing and marketing strategies include: EC-504, *Cash Market for Corn*; EC-505, *Developing a Corn Marketing Plan*; and EC-627, *Seasonal Price Patterns of Indiana Commodities*.

Financial Responses

As farms have become larger and more specialized, use of production responses such as enterprise diversification has diminished. Use of marketing responses to reduce risk has increased with the greater variability of commodity prices, but price variability has not been eliminated. As a result, the importance of financial responses to risk has increased.

Typical Financial Responses

Financial responses to risk generally affect the firm's solvency (debt/equity ratio) or liquidity positions. During the late 1970's, many farmers found their solvency increasing with rising land values. With decreasing land values, solvency typically declines. Managing the pace of investments and withdrawals, as well as the means of asset acquisition, can have major effects on solvency. Liquidity reflects the amount of time required to sell an asset and the discount in sale proceeds resulting from a forced sale. Savings accounts, grain in the bin and market livestock are highly liquid assets because they can quickly be converted to cash and their liquidation costs are low. In contrast, land is considered an illiquid asset because liquidating a tract of land on short notice generally involves a substantial discount in sales price. In times of general financial stress, many durable assets can be very illiquid.

Insuring Against Losses

Insurance is a financial response to risk which provides a specialized source of liquidity. Most farmers use various forms of insurance to protect against specific types of losses. Fire insurance provides liquidity to replace losses due to fire. Most farmers find that commercial fire insurance is more cost-effective than maintaining a reserve of funds to offset a loss (self-insurance). Self-insurance and commercial insurance both involve costs for risk protection.

The idea of insurance is to buy protection for a loss. Expenses associated with providing commercial insurance (the insurance load factor) may vary from 10 to 50 percent or more of the premium. The premiums paid by most individuals will far exceed the amount they receive back from the insurance company.

Risks which have a low probability of occurrence and very adverse consequences are the most logical risks to insure against. Liability, major medical, life, disability and fire/extended coverage on buildings, equipment and livestock are examples of insurance which many farmers carry. Self-insurance,

included in the normal cost of doing business, is generally more cost-effective for risks which occur frequently and cause only minor problems. Insurance to protect against hog deaths in finishing could probably be obtained, but farmers typically average out these losses as part of normal production costs.

Many other types of insurance with different levels of coverage are available. One's financial position is important in determining whether to self-insure or buy commercial insurance. A farmer in a strong financial position using the car only to drive to church might logically decide not to carry collision insurance—even with a very high deductible. In contrast, another farmer in a weaker financial position whose spouse drives to work every day may logically carry collision insurance with the minimum deductible.

Crop insurance and hail/fire insurance are examples of insurance options which depend heavily on the financial position of the farmer. Crop insurance has options for coverage of 50, 65 and 75 percent levels of yield coverage. A farmer in a strong financial situation may decide to forgo participating in the crop insurance program, electing to self-insure for possible losses. In contrast, a farmer in a weak condition may elect, or be required by the lender, to carry crop insurance. Decisions on whether to carry hail insurance are influenced by similar factors, as well as producers' perceptions of the probability and extent of hail damage. For a discussion of crop insurance, see EC-612, *Understanding and Evaluating Crop Insurance*.

Maintaining Reserves

Having reserves to provide liquidity is another financial strategy for dealing with variability. Many farmers use inventory reserves as a cushion that can be drawn upon in times of adversity. Inventory reserves, like a bin of grain, would be a current asset on the farmer's balance sheet. If an unexpected event occurs, the grain can be sold and the proceeds used. Although a bin of grain is better than no reserve, stored grain does have some risks associated with it. The price could go down, reducing the value of the reserve. Stored grain earns no interest, and the grain could go out of condition. Insurance and taxes, as well as interest forgone, are other costs associated with maintaining inventory reserves.

Some farmers maintained financial reserves such as bank accounts, mutual funds, stocks, bonds and other financial assets for bad times. Most of the farmers interviewed indicated that they would like to maintain greater financial reserves. For many farmers

in the growth and expansion phase (or even in a holding phase in recent years), major financial reserves are not feasible because any earnings are reinvested in the farm business.

Farmers should consider what returns are likely to be for both farm and nonfarm activities. Some nonfarm investments may offer high returns and diversification in investments. Furthermore, these nonfarm investments can serve as financial reserves.

Farm families do need a personal or family financial reserve if at all possible. The purpose of this reserve is to reduce stress in the family and allow the household to operate. For example, if the washing machine breaks down, a family should be able to fix it without having to consult their lender. This type of a reserve is important, but should not be abused. Many lenders can tell stories of personal expenses making good loans go bad.

For most farmers, the size of inventory and/or actual financial reserves they can hold is small relative to their capital needs. Therefore, holding a credit reserve is a common financial response to variability. A farmer may limit borrowing to have a reserve of unborrowed funds to draw upon in response to unexpected events. In some cases, an individual may actually borrow \$100,000 and only use \$75,000. The "extra" \$25,000 may be deposited in an interest-bearing account. There is a cost involved in this, however, because the interest rate paid is generally greater than the interest rate received.

Some farmers have established a line of credit at a financial institution in excess of their anticipated needs. They are charged interest only on the amount actually borrowed, but can obtain the full amount if desired. Generally, this line of credit would be for operating expenses and not for capital expenditures. Most lenders will probably restrict this type of arrangement to their better borrowers, but it is a convenient arrangement for those who qualify.

The study of farmers' responses to variability indicated that producers gave greater importance to maintaining financial reserves than to inventory reserves. Credit reserves were also considered less important than financial reserves. However, because of actual conditions, slightly more farmers (over 68 percent) had credit reserves as opposed to about 65 percent with financial reserves. Only about 46 percent used inventory reserves, and these were often related to marketing strategies.

Pacing of Investments

Managing the pace of investments was considered the most important response to

variability by the producers interviewed in the 12-state study. Pacing investments was used by almost 90 percent of the producers interviewed. Postponing capital expenditures, including replacement of durable assets, is a response to adversity. Some control over withdrawals for consumption, taxes and other purposes is also possible, but many farm families have less flexibility than they had in the past on withdrawals from the business.

Budgeting and cash flow analysis are tools which are commonly used in helping to decide whether an investment or expenditure should be made. It is important that budgets reflect the individual producer's situation and risk costs. Budgeting typically averages out variations in prices, costs and yields. The costs incurred if an unfavorable event occurred in the first year are commonly not included. This cost would be at least equal to the interest on the income shortfall.

Cash flow analysis based on "the going concern" results can be misleading if there are substantial start-up costs. Beginning or expanding livestock enterprises or major changes in crop technology can involve substantial start-up expenses. Budgets and cash flow analysis should also include a risk cushion, a reserve for unknown or overlooked risks. For a further discussion, see EC-617, *Budgeting to Avoid Investment Errors*.

Acquiring Assets

Procedures to acquire assets are an important risk response which is closely related to managing the pace of investments. Leasing rather than purchasing assets may be another way to maintain greater liquidity in the farm business. Very commonly, farmers cash- or share-lease land, allowing greater investment in short- and intermediate-term assets. Debt commitments are avoided, and liquidity of the firm is preserved. Cash rents for land represent fixed commitments and do not adjust rapidly to changing conditions. In contrast, crop share leases are highly efficient in sharing risks of changing conditions between the farm operator and landlord. Both cash- and share-leasing of land incur the risk of losing control of the leased land, a risk not present with land ownership.

Leasing of other assets is not widespread in agriculture, especially in relation to the non-farm sector. Machinery, buildings and equipment can be leased on a long-term basis. Traditionally, farmers have preferred to own rather than lease assets. However, tax laws have provided incentives for farm finance leasing, and some farmers have found it advantageous to lease.

Enterprises can sometimes be initiated with other than turn-key operation facilities, thus improving liquidity and solvency. Experience can be gained and projects aborted with relatively little loss. For example, hog production can be started in low-cost or existing facilities, with one or two litters the first year. Used machinery may be used instead of new machinery. Beginning farmers may start with less than a full line of machinery. For example, custom combining may be hired. Projected profits may be less, but this is the cost associated with reduced risk.

Limiting Credit and Leverage

Credit or loan limits influence the degree of leverage in a farm operation. Credit limits may be internal, that is, imposed by the farmer ("Never buy land unless you can put 50 percent down"). Alternatively, credit limits may be external, imposed by the lender ("The most we can go on operating expenses is \$50,000 this year, and you'd better not buy that new tractor you talked about").

Events of the last few years have shown that what were considered fairly conservative credit limits in the past can get people into trouble. Some of the factors to be considered are:

- managerial ability of the operator
- absolute size of the loan (\$1,000 vs. \$1,000,000)
- use of funds
- loan arrangements.

Managerial ability of the operator can make a major difference in the amount of debt which can be handled. The better manager simply has a bigger margin between returns and costs than a poorer manager. This margin serves as a cushion for adversity, and the size of this cushion grows over time. Remember that about one-half of the farmers are below average in their managerial ability.

Absolute size of the debt has some influence. An individual may feel more comfortable owing \$10,000 with an equity of \$1,000 than owing \$1 million with an equity of \$2 million. In part, this relationship exists because it may be easier to repay a small loan than a large loan if it turns out to be a bad investment. Larger loans may also be difficult for lenders. Legal and/or financial limitations may make it impossible for lenders to work with potential borrowers with very large needs. Furthermore, as the proportion of their portfolio committed to a particular borrower increases, lenders may want greater security.

Intended use of funds also affects acceptable debt levels. Some uses, like fertilizer and feed, have a high pay-off and quick returns. Buildings and machinery pay off over longer periods. Land is a very long-term investment, even with favorable financial conditions. Lenders generally are more willing to loan a higher proportion of funds for uses with faster returns.

Loan arrangements, the scheduling, timing and term of loan repayments, are also important. Start-up expenses can be considerable and initial returns slow for some investments. Financing an expansion of the hog enterprise may involve a period of 18 months or more before the additional returns are realized. In cases like this, scheduling a loan payment in 12 months may cause substantial difficulties. Arranging loan payments to coincide with expected receipts reduces asset management problems. For a hog enterprise with 6 marketings per year, several payments during the year may be easier than an annual payment requiring accumulation and investment of funds throughout the year. The term of loan repayments should also be in line with economic returns expected from the investment. If machinery is giving a return over a 7-year period, financing should generally not be on a 3-year note.

Table 3 indicates the loan amount which can be serviced by \$1,000 of annual net income. For example, at 5 percent interest, \$1,000 of net income can serve a 1-year loan of \$952, a 5-year loan of \$4,329 or a 30-year loan of \$15,373. Increasing the interest rate to 7 percent reduces the size of the 1-year loan which can be serviced by \$1,000 of net income to \$935 and a 30-year loan to \$12,409. Effects of changes in the interest rates are greater on longer-term loans because a larger proportion of the payment goes to interest rather than repayment of the principal.

Working Off-Farm

Off-farm employment is another financial response to risk. Many farmers and spouses have part- or full-time off-farm jobs which increase the firm's capacity to bear risks. Some off-farm activities may be agriculturally related, such as custom work, grain hauling or seed and fertilizer sales. Other off-farm activities may be entirely unrelated to agriculture. Most farm families would probably indicate that these off-farm activities are to supplement income for family living, but they are a significant response to risk in many instances. For many farm families, off-farm activities are a form of diversification of enterprises.

Table 3. Amount of a Fully Amortized, Level Payment Loan Which Can Be Serviced by \$1,000 Annual Net Income, at Various Repayment Periods and Interest Rates.

Interest Rate (%)	Repayment Period of the Loan					
	1 yr.	3 yr.	5 yr.	10 yr.	15 yr.	30 yr.
	-----(\$)-----					
5	952	2723	4329	7722	10380	15373
7	935	2624	4100	7024	9108	12409
9	917	2531	3890	6418	8061	10274
11	901	2444	3696	5889	7191	8694
13	885	2361	3517	5426	6462	7496
15	870	2283	3352	5019	5847	6566
17	856	2210	3199	4659	5324	5829
19	840	2140	3058	4339	4876	5235
21	826	2074	2926	4054	4489	4746

Management Implications

Financial responses generally affect the firm's capacity to bear risk rather than the occurrence of unfavorable events themselves. "Going broke" or "having cash flow problems" is the consequence of one or more other risks, not a risk itself. Financial responses should be designed to reduce the adverse consequences of these other risks. Farmers in strong financial positions have flexibility in choosing their risk responses. In contrast, lenders may have considerable influence on the financial responses to risk employed by farmers using significant borrowed funds.

Integrated Risk Management Strategies

Risk balancing is fundamental to risk management for most farmers. If they take an action in one aspect of the business which increases risk, an offsetting action is taken to maintain total risk constant. As one producer expressed it, "If I borrow money to buy feeders, I hedge." The increased risk associated with borrowing is offset by reducing the risk of output price variability. Other producers indicated that if taking one action would require an offsetting action to keep risk within acceptable limits, they do not take the first action. This is another form of risk balancing which can be equally as effective.

Because of the multiple sources of risk, comprehensive strategies that integrate several responses to variability are often necessary for effective risk management. The particular combination used by an individual farmer will depend on the individual's circumstances, type of risks faced and risk attitudes. Table 4 summarizes the risk responses discussed in this publication by area of the

farm operation and by their primary effect in risk management. Some risk responses act primarily to reduce the chance that an adverse event will occur, while other responses have the effect of providing protection against adverse consequences should the unfavorable event occur.

Indiana grain and livestock producers typically use a combination of production responses in their risk management. Corn, soybeans, wheat, hogs and dairy cattle are the major enterprises on most farms, and these are among the low-risk activities. Farmers commonly combine enterprises, although diversification possibilities may be limited. Typically, farmers use production practices selected to be effective in a variety of circumstances. Dispersing production geographically, maintaining flexibility and varying production capacity are of lesser importance to many farmers.

The marketing responses of spreading sales and forward contracting, combined with market information, are very common for Indiana producers. Most producers also maintain their eligibility to participate in government commodity programs, although their participation is likely to depend on program specifics. Use of hedging and options trading are less common, but many producers are following developments.

The financial responses are used to increase firms' capacity to bear production and marketing risk and to cope with financial risks as well. The adverse conditions of recent years have increased producers' awareness of financial responses. Many producers combine several, if not all, of the financial risk responses.

The risk responses available to an individual and the degree to which one can make use

Table 4. Risk Responses by Area of the Farm Business and Primary Effect in Risk Management.

Area of the Farm Business	Effect in Risk Management	
	Reduce Chances of Occurrence	Provide Protection Against Adverse Consequences
Production	Choosing low-risk activities Diversifying enterprises Dispersing production geographically	Selecting and diversifying production practices Maintaining flexibility Varying production capacity
Marketing	Obtaining market information Spreading sales Forward contracting Hedging	Participating in government programs Options trading
Financial	Working off-farm	Insuring against losses Maintaining reserves Pacing investments Acquiring assets Limiting credit and leverage

of a response are affected by factors outside the individual's control. For example, many farmers would like to forward contract corn for \$5.00 per bushel, but the opportunity does not exist. Maintaining a \$25,000 credit reserve is also not feasible for some farmers. Part of good risk management is recognizing what is feasible and effective in individual circumstances.

A comprehensive strategy integrating production, marketing and financial responses will reduce risk more effectively than will a series of separate and individual responses. Which integrated risk management strategy is best depends, again, on individual circum-

stances. A farmer's goals and risk attitudes, expectations about the future, equity position, resources available, financing available, market availability and other factors affect which combination of responses is best. As these factors change, so will the best strategy.

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Historic Document

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